THE ROLE OF THE MULTI-PURPOSE CANISTER IN THE WASTE MANAGEMENT SYSTEM

In 1994, the U.S. Department of Energy (DOE) began developing a plan for managing spent fuel that would use one type of container for storing, transporting, and disposing of high-level radioactive nuclear waste. This container, called a multi-purpose canister (MPC), allows flexibility in making future plans for dealing with spent fuel. The MPC design reduces the amount of contact technicians have with the spent fuel rods, making transfer of waste from one location to another a safer process. The fact that one MPC design can be used throughout the storage, transport, and disposal stages adds to the overall efficiency of the waste management system.

4.17 Introduction

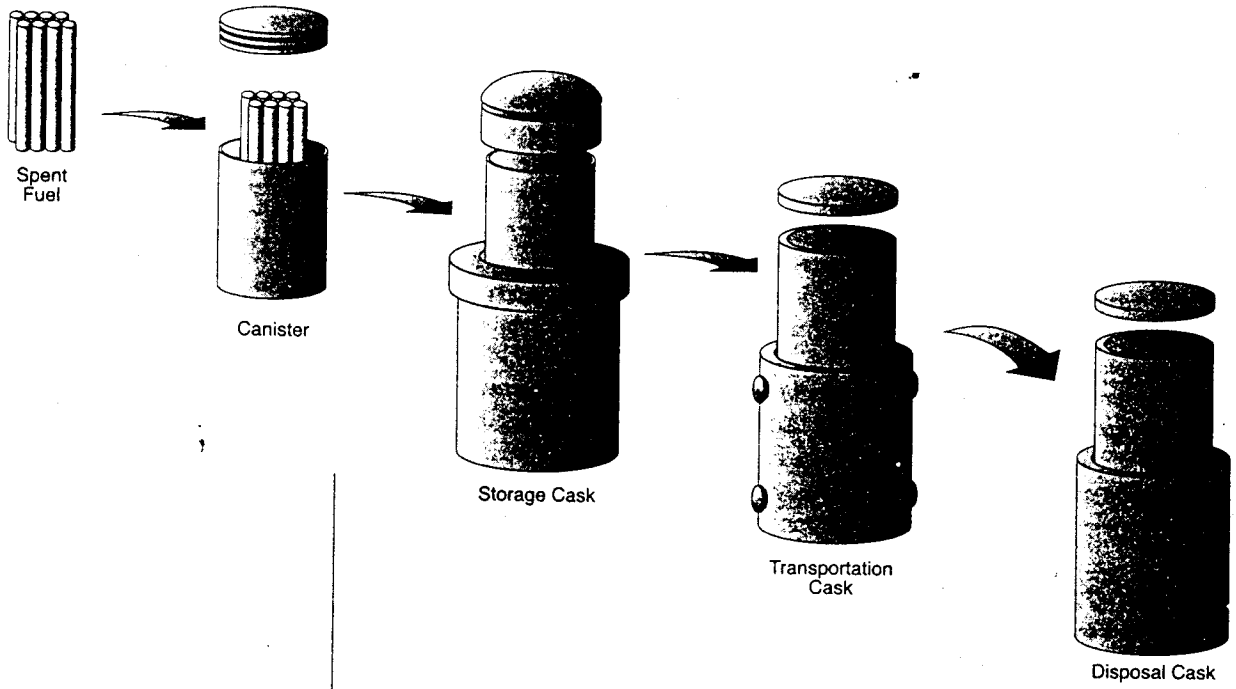
What is a multi-purpose canister?

What are the possible uses of the MPC?

DOE is considering the use of a system for managing spent fuel that relies on placing the used fuel assemlies into a specially designed canister that would be welded shut. Once inside this container, the spent fuel could be stored in an upright or horizontal position, transported to another location, or permanently disposed on a geologic repository. Because the canister would serve these different functions, it has been called a multi-purpose canister (MPC).

Whether in storage at a reactor site or at a permanent repository, or during transportation, the spent fuel would stay inside the MPC. A different outer container, or cask, would be used in each situation.

- For temporary storage at a reactor site, the MPC would be put inside a storage cask that could be placed on its side (horizontal) or on one end (vertical).
- For transportation to another site, the MPC would be packed into a transportation cask.
- For final disposal, such as in a geologic repository, the spent fuel would stay in the MPC and be enclosed in a disposal cask.



An MPC loaded with spent fuel may be used in either of three different casks for storage, transportation, or disposal.

Each type of outer cask for the MPC is a kind of overpack, a protective outer covering that contains the inner material and shields the outer environment.

What are some advantages of the MPC?

A big advantage of the MPC is that it minimizes the handling of spent fuel, which reduces costs and the workers' exposure to radiation. The MPC has also been designed to hold a larger number of spent fuel assemblies than other cask models and thus it will reduce the total number of waste shipments, saving money and time.

4.18 The MPC Design and Standards

Who regulates the design of the MPC?

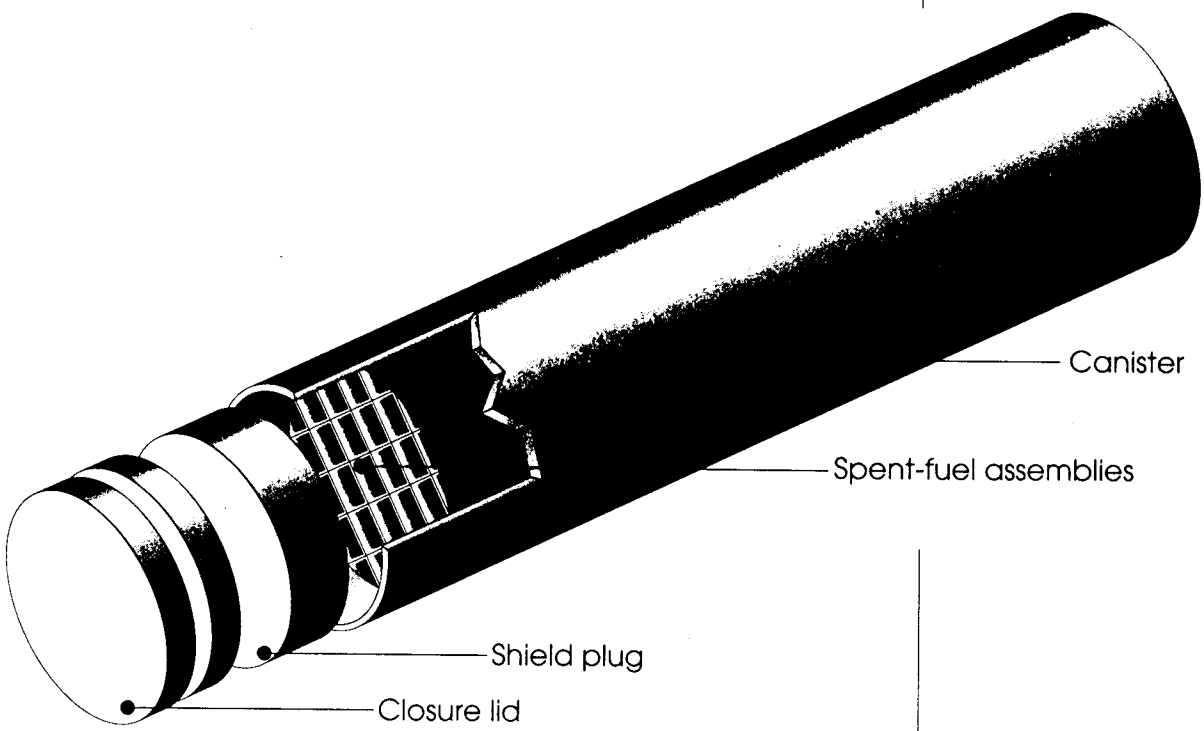
What are some of the design regulations?

The Nuclear Regulatory Commission (NRC) regulates the design for the MPC. Among their regulations is the need for great structural strength. This is so that the MPC inside a transportation cask can withstand a transportation accident and maintain safe radiological limits. The overall structure of an MPC

is a large steel cylinder, opening on one end only. Inside the MPC is a fuel basket, a metal grid assembly that holds the spent fuel rods in place and prevents a criticality by absorbing neutrons released from the remaining fissionable fuel. It also transfers heat to the outer surface and adds strength to the MPC. This basket must also remain intact under hypothetical accident conditions.

Once the inner basket is loaded with spent fuel rods, a heavy metal shield plug is welded in place over the open end of the MPC, followed by a closure lid, which is also welded in place.

Multi-Purpose Canister



Another regulatory requirement for storage that the MPC must meet is that the temperature of the fuel cladding inside the canister may not exceed 340 °C (644 °F).

4.19 Spent Fuel Storage

How could the MPC be used at a commercial reactor site?

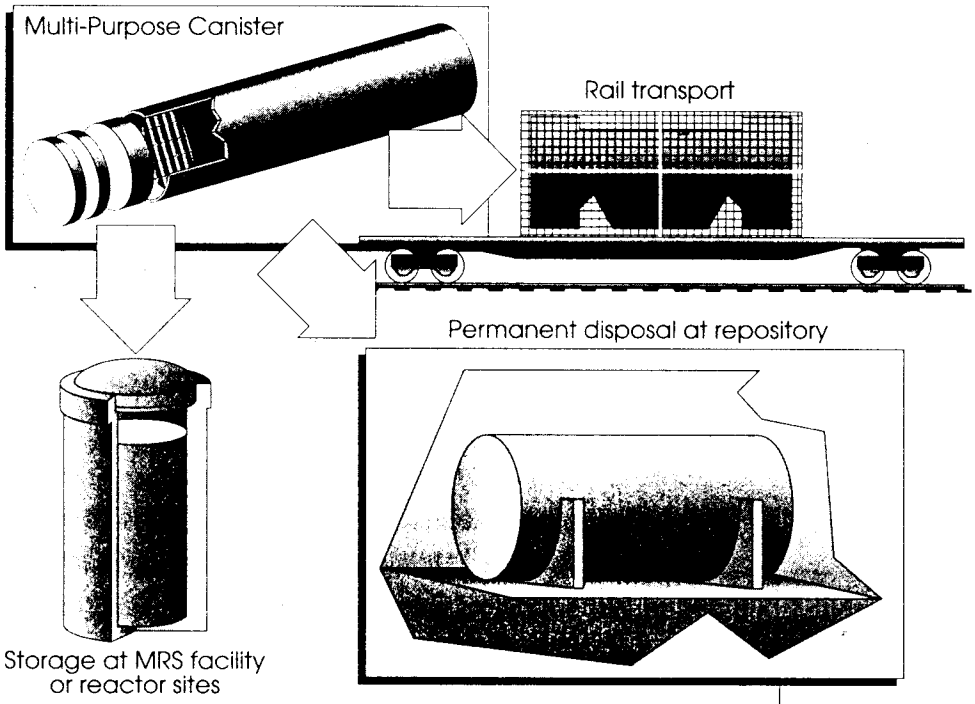
The only waste carried by an MPC is spent fuel rods from commercial nuclear powerplants in the United States. Most of these sites currently store spent fuel in large pools of water reinforced with concrete and steel. The water provides a barrier against the high radioactivity of the fuel rods. But rods can also be stored in a dry environment, such as heavy containers or casks made of steel or concrete, usually in above-ground facilities. The MPC is intended to supplement the available space for storing spent fuel. The MPC's design is based on storage technologies already proven to be safe.

To make the best use of the MPC for storage, the canisters must be filled with the maximum number of spent fuel assemblies. In order to fill up an MPC, the commercial reactor sites must have the appropriate equipment, including cranes for lifting and moving the MPCs. Not all reactor sites are made the same or operate in the same way. The MPC's design, however, is such that it can be used at most reactor sites. Two sizes of the MPC have been proposed to satisfy the needs of the different types of commercial nuclear reactors.

4.20 Transportation

How is the MPC transported from a reactor site?

Until a permanent geologic repository is ready, MPCs may be used for dry storage of spent fuel at nuclear reactor sites. Provisions have also been made so that some utilities can ship uncanistered fuel in transportation casks to a temporary facility where spent fuel could be repackaged into an MPC. Most of the U.S. nuclear powerplants are accessible by rail, and most MPCs transporting spent fuel will leave reactor sites by rail. However, the sites without rail access will be able to load smaller MPCs with spent fuel, which will then be carried away by heavy-haul trucks or barges to the nearest rail access point. Once it leaves the reactor site, a full MPC can travel to a temporary storage site or a permanent disposal facility, such as a repository.



4.21 At a Geologic Repository

At a geologic repository, the MPC would be unloaded from the transportation overpack and placed into a disposal overpack, which would be welded shut. This package would then be moved down a ramp to the designated underground disposal area.

What happens to the MPC once it reaches a repository?

4.22 Schedule and Cost

The first MPC should be available for use at a reactor site in fall 1998. The first transportation cask for transporting an MPC to a storage facility should be ready by January 2000.

When will the MPC be ready for use at reactor sites?

An MPC and its storage overpack will cost more than a cask designed for storage only. This is mainly because of the high structural strength needed to meet the transportation accident conditions and because of the need for special aluminum in the fuel basket to control criticality. The costs, however, are offset by the savings in the overall waste management system that

Why is the MPC considered a cost-saving measure?

would result from the use of a standardized container like the MPC. Personnel requirements and safety concerns would also be significantly reduced because of the limited amount of waste handling work that would result from using the MPC.

4.23 Stakeholders Involvement

What is a stakeholder?

Who are the primary stakeholders in the MPC issue? Why?

DOE believes it is important to involve stakeholders — people who are potentially affected by nuclear waste management — in major decisions. With the MPC, the primary stakeholders are the utilities that operate commercial nuclear reactors because they would be directly involved in using the canisters. Utilities would have the benefits of lower costs for waste storage and less exposure to workers. Utilities also would benefit from greater levels of transport and storage safety. Other stakeholders include public interest groups, equipment manufacturers, industry and utility organizations, cooperative agreement groups, and government regulators. These groups are concerned with such issues as environmental safety and public health, employee safety, costs, workloads, and equipment requirements.

DOE regularly holds workshops and public meetings to involve stakeholders in two-way discussions about design reports, opinions, and concerns.